DOCUMENT RESUME

ED 310 143 TM 013 726

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TITLE Problems in Constructing an Observation Instrument for Instructional Cues: A Pilot Study. Twente Educational Memorandum No. 20.
INSTITUTION Twente Univ., Enschede (Netherlands). Dept. of Education.
PUB DATE Jun 80
NOTE 29p.; Paper prepared for presentation at the IEA/CES Meeting (Hamburg, West Germany, June 1980).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150) -- Tests/Evaluation Instruments (160)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Classification; *Classroom Observation Techniques; *Cues; Elementary Secondary Education; Foreign Countries; *Instruction; Learning Processes; Mathematics Instruction; Pilot Projects; Problem Solving; *Research Problems; *Test Construction

ABSTRACT

This study dealt with the construction of an observation instrument for instructional cues. Cues are defined as a complex of instructions, methods, and conditions by which students both learn the material and learn to apply the material. As part of the "Classroom Environment Study: Teaching for Learning," the pilot study began a review of the relevant literature to aid in the development of a list of cues, which were placed into a category system. A tentative list was assessed by observers watching audiotaped micro-teaching situations and mathematics and physics lessons. Some problems were resolved by adding items; others required better operationalization of cues. Remaining problems with the observational instrument will require: (1) establishing an instrument for which the description of the categories and the choice of items are based on the agreement of a larger sample of judges; (2) establishing an instrument that can be used in a variety of classroom situations and for a variety of instructional methods; (3) gaining information about what instructions and practices should be contained in an observers' manual; and (4) making the observation suitable for construction of better scales for the variables. If possible, interval scales should be developed. A list of cues, descriptions of the classification categories, and the instrument are appended. (TJH)

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PROBLEMS IN CONSTRUCTING AN OBSERVATION INSTRUMENTS FOR INSTRUCTIONAL CUES

A PILOT STUDY

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Paper prepared for the IEA/CES : TL-meeting
Hamburg, June 1980

Project 030 Classroom Environment Study

Twente Educational Memorandum nr. 20
Enschede The Netherlands: Twente University of Technology,
Department of Applied Education, June 1980

Preface

This pilot study deals with construction of an observation instrument for instructional cues. Cues can be defined as a complex of instructions, methods and conditions by means of which the pupil both acquires the components of the learning material and learns to apply it.
This study is a part of the project Classroom Environment Study: Teaching for Learning.
Below we give a brief description of the CES.

In the first stage of the study measures will be obtained of the following process variables by way of observation: academic engaged time, task-oriented classroom climate, instructional cues, questions, feedback and correctives.
These measures will then be correlated with measures of achievement and attitudes of the pupils in those classes.
The resulting correlation will be used as the basis for the formulation of desirable teaching practices.
The second stage is an experiment. The assumption that correlations suggest what is more desirable will be tested. The desired teacher practices will be transformed in training materials and procedures. The training will be given to teachers who have been randomly assigned to the experimental group. Both the experimental and the control group will be observed. Prior to the training of the experimental group the pupils will be tested. Then the classes of all teachers will be taught the same subject matter. After the training, both groups of teachers will again be observed to obtain estimates of the effectiveness of the training. After a period of teaching of the same curriculum, the pupils will be given achievement tests and attitude inventories. The obtained data will be analyzed to determine whether the classes of the experimantal-group teachers manifest higher achievement and more desirable attitudes than those of the control group.

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Summary

We report here about a small project aimed at the construction of an instrument which enables us to observe cues in a classroom situation.
Starting point was among others the review of Levin with eight manifestations of instructional cues. On the basis of our experience and available literature we have formulated a great many items which cover the cues variable as good as possible.
To this list several cues have been added, others have been excluded for several reasons. Some cues were combined to produce a list more apt to be used by an observer.
We attempted to group the items in a few categories, so as to reduce the number of cues variables in the Classroom Environment Study.
A tentative list was tried out in video-taped microteaching situations and also in a few lessons in mathematics and physics. Some problems for the observers could be met by adding items, otherproblems call for better operationalizing of cues followed by clear instruction -often: distinction- in the observers manual. Still there are several problems with the cues instrument that should be solved. Further try-outs are necessary for

- establishing an instrument for which the description of the categories and the choice of items is based on the agreement of a greater sample of judges.
- establishing an instrument that can be handled in a variety of classroom situations and instructional methods.
- gaining information about what instructions and practice should be contained in an observers manual.
- making the observation suitable for construction of better scales for the variables, if possible an interval scale.

This short story does not claim reliability or methodical thoroughness. Its value should be sought in the fact that

the whole process of gaining information, generation of tentative items, search for empirical evidence and estimation of practical manageability of the resulting instrument has once been done on a small scale.
The result can be a more sophisticated program for establishing the desired instrument for observation.

1. Introduction

1.1. The concept of instructional cues.

The concept of cues is one of the elements of instruction in Bloom's model (Bloom, 1976).
It can be defined as a complex of instructions, methods and conditions by means of which the pupil both acquires the components of the learning material and learns to apply it. (Levin, 1977)
Generally speaking, cues inform the pupil what he is going to learn and how his learning process should proceed. They can be considered as directions what the pupil is supposed to do during the learning process. A very important source of these learning directions of course is the teacher, but they can be found in the learning material as well.

According to Levin's review (Levin, 1977) the instructional cues have the following manifestations:
- knowledge of learning objectives
- demonstration and practice of the material learned
- definition of learned concepts
- content organization of learning material
- signals of transition and importance
- clear explanations
- written questions in the learning material
- visual and content emphasis in the learning material.

Since the CES is primaraly interested in instructional cues used by the teacher, the last two forms are omitted, which does not mean that they are less important.

1.2 Theoretical basis for instructional cues.

Though we think that this paper is not the appropriate occasion for thorough theoretical expatiation on the concept of cues, some remarks can be made.
It can be argued that it is very important to start from available theories when one is constructing an observation instrument.

An advantage from such a starting point is that one uses existing theoretical constructs which can be conducive to the cumalation of scientific knowlegde in the field of instruction. From a theory constructs or variables should be operationally stated on behalf of the items for the observation instrument, in Bloom's discussion on instructional cues the reader is not referred to a theory of learning.

We think that theories which focus on the processes of learning, like the information-processing theories of learning and memory, are relevant for the concept of cues.
Those information-processing approaches to human learning resulted in usable theories which are a good framework for instructional cues.

In our opinion the work of Gagnê is very relevant in relation to cues. In his theory Gagnê deals with complex learning processes - and school learning is very complex indeed.
The external learning conditions must be created by the teacher or the learning material and they must link up to the internal conditions, the learning of the pupil.
The external learning conditions are of great importance for the internal processes.
His notion of instructional events is strongly related with the concept of cues as used in the CES.
In several publications (eg in Gagnê, 1974) he distinguishes essential moments in every instructional process, namely

- activating motivation
- informing the learner of the objective
- directing attention
- stimulating recall
- providing learning guidance
- enhancing retention
- promoting transfer
- eliciting performance coupled with providing feedback.

In Gagnē and Briggs (1974) stimulating recall has been more specified by relating this event of instruction to prerequisite learned capabilities. It can be argued that much of what pupils learn is a combination of ideas.
In our pilot-study it appeared that items made to represent this particular cue were useful in observing classroom instruction.

We intend to give a further elaboration of the theoretical background of the concept of instructional cues in another paper.

2. Determination and first selection of cues-items.

2.1. What we considered to be cues-items.

A cue is considered as an indication or direction given by the teacher or the learning material, which facilitates learning. Most cues are related to content matter. Some of them have to do with classroom management. We excluded cues that are only for classroom control and have no connection with the learning process itselt.

For this reason we excluded cues like
- The teacher demands attention from pupils during lesson.

An item is the description of an observable event in the classroom, which may be considered as an example of a cue. Yet it might be supposed that these items are not enough subject matter specific. In our case this means that they only should be relevant for observing lessons in mathematics.

2.2. Restriction to observational cues.

Our purpose was to make an instrument for classroom observation. For that reason we did not include observation of cues in the learning material, as already mentioned above. (1.2.)
Moreover, we assume an observer who posesses no detailed knowledge of the learning material and who has not been present in former lessons.

For that reason the following items can not be observed:

- The teacher links up to where he did get in the last lesson.
- Where the text book merely concerns itself with definitions of concepts, the teacher gives complementary examples.
- The teacher gives other examples as used in the text book.
- The teacher provides extra material where the textbook suffers from lack of clarity on a particular issue.

Ofcourse there may be cues related with linking op with former lessons, and with making reference to the learning material. These cues should be described by items, observable for a trained, though "fresh" observer.

2.3. Making decisions clear for the observer.

Unclear descriptions in items, or descriptions that force an estimation by the observer, make the instrument less reliable. Though the reliability can be restored to some level by training of observers -make all the observers take the same decision- we excluded some items which are formulated to vague (high inference). For that reason we excluded items like

- Teacher spends a regular part of the lesson on summarizing the subject matter.
- Teacher spends a reasonable amount of time in focusing attention on a particular problem or subject.
- Usually the teacher gives examples when he defines a concept.
- Teacher gives clear explanations
- Teacher gives clear instructions

2.4. Distinction between providing cues and presenting subject matter.

A great portion of lessons is filled with explanation by the teacher on the subject matter. Explanation can be given without the use of cues. We do not consider as cues the mere recitation of facts, principles, rules etc. even when the teacher uses the blackboard or other visual aids. Only when the teacher takes action to make structure in the subject matter, when he brings out in relief the relative position of parts of subject matter, when he relates to well known facts and principles, when he tells the pupils what and how to learn etc., only then we speak about providing cues.

For that reason we excluded items as
- Teacher points out important ideas verbally.
- Teacher gives a definition of a concept.

For the use of visual aids we take up instructions in the observation manual, so that this should only be considered as a cue if it serves more purposes than presenting subject matter.

2.5. Construction of a tentative item list. (first draft)

On the considerations given above we managed to make a list of 36 items. For that list we mainly used the earlier list with our first items and we included some items that we felt to be excellent instances of cues.
This list is given in appendix I.
The items in this list were deliberately placed in random order, for the purpose of the process described in the next chapter.

3. Construction of broader categories.

3.1. Need for reduction of variables.

The cues observation instrument is to serve in the Classroom Environment Study as one of the instruments, in conjunction with "questions", "feedback and correctives" and "time on task". The whole study can, for methodologic reasons, manage at most 15 variables. For that reason the occurence at 36 cues may not be translated in the same 36 variables for the analysis-phase, but the evidence from cues observation has to be narrowed down to some 3, 4 or 5 variables. This necessitates a nearer conceptualization at the cues phenomenon. Our procedure for that is not to be seen as a thorough and definitive identification of concepts. It is a try out, just to see how the procedure works and as such it may be seen as a pilot study for a more exhaustive project, that should result in a more sophisticated instrument.

3.2. Procedure.

On the basis of sources mentioned in the introduction we tried to describe - at most - five categories, in which the cues items should be classified. We did not succeed in the formation of less than five categories, which could cover the whole range of what we considered as possible cues.
We asked three colleagues - who know the project but not our considerations about the cues - to assign each of the 36 items to the five described categories, while we also made such an assignment for ourselves. Comparing these four assignments we found some differences that could readily be removed by slight clarifications in the category descriptions.
One example of such a correction: To the B-category should be added the indication of social context of learned subject matter, not only the applications or context in daily life.
After correction for that we found five items for which more than one judge did not agree with the others. (Judges could indicate at most two categories). The result of this short inquiry is given in appendix II.
We also asked for other examples of classroom events (items) which could fit the given formulation for some category. No contributions resulted from this request.

3.3. Description of the categories.

Although written and oral questions in the categories described by Levin may be seen as cues, we did not include questions, as another observation instrument is to be developed for that.
As pointed out before, we do not consider "definition of learned concepts" as a cue for itself, because it is a natural event in the presentation of the subject matter. Nevertheless we are attentive, that the pronounced use of clear definitions shall be marked as a cue.
For reasons of getting better decisions we did not make "clear explanations" a category in our system. Furthermore we imagine that the occurence of a clear explanation can be described in several items, which an observer can distinguish better.
The use of emphasis can be placed under the same heading as a signal of importance.

For the description we introduced the concept "learning element", which can be a fact, a concept, a rule, an algorithm or another method for problem solving. We assumed, that there is a distinction between the activities of a teacher explaining and making clear one element, and the activities to explain relations among a set of learning elements. To the first category belong items like demonstration, giving concrete examples, giving explicit applications etc.. In the second category we could place relating with former lessons, giving an overview of a topic etc.. It should be emphasized that experience from everyday life and knowledge from instruction long ago and fully understood are not considered as learning elements.

Apart from some categories strongly associated with content, we made a reservation for one content-free category, associated with the structure of the lesson and the instructional system.

With these considerations we arrived of 5 categories (for a detailed description see appendix III).

A. Specifying learning objectives.

B. Clarification of learning elements.

C. Organization of content and learning material.

D. Signals of transition and importance.

E. Structuring of lesson.

The verbal description of these tentative "variables" should not be considered as the only definition. The limitation of the categories and the fixation of boundaries between them is also accomplished by giving examples, in concrete by the grouping of available items in the categories.

The formation of concepts out of a list of items can also be obtained by techniques as cluster analysis. This may be the object of a more detailed study.

3.4. Results of the inquiry.

For 5 items we found not enough interjudge-agreement even after slight reformulation of the category descriptions. We decided to drop these 5 items. (mentioned in appendix III).

We could produce a new list for try out in classrooms by adding to the categories B, C, D, E the item "others". We deliberately did not add this to A, because many cues can be considered the communication of (parts of) learning objectives.

For this reason we only consider a rather complete communication about pupils intended abilities after instruction as learning objectives cues. The purpose of the "others" item was of course to give observers the opportunity to bring in new items. Furthermore we reduced the list slightly by taking together some items, (14&22, 2&26), and we made some minor modifications in the formulation. The resulting list is given in appendix IV.

4. Try-out in classroom situations.

4.1. Organization.

Four observers were involved in the observations. They observed two mathematics lessons in groups of two. One observer - one of the developers of the instrument - also attended two physics lessons.
All lessons were audio recorded.

The observed cues were to be marked on a coding sheet, which fitted to the form containing the descriptions of the items. The horizontal scale of the coding sheet was a time axis. (appendix V).
Later we found it necessary to reserve one extra row for indication of the type of classroom activity. A rough scheme as given here could be good enough:

I. Teacher talk with no - or minor - interaction.
II. Teacher and class interact, questions come to and from the teacher.
III. Class is divided in subgroups or individuals, who work on assigned tasks, no central instruction.
IV. Class and teacher are not involved in learning tasks.

The observers were supplied with an instruction, containing the following remarks:

- code the whole lesson. (50 minutes minus loss at begin and end).
- mark only cues observable for the whole class.
- longer events (e.g. a summary) can be indicated with a horizontal dash instead of a tally, thus marking begin and end-time.
- try to avoid coding one event in more than one category, try to decide what category applies best.

- your primary decision is in what category a cue should be marked, do not bother about a choice between e.g. B3 and B5.
- if you encounter a cue that is not represented by an item, try to make a short description and an assignment to one of the categories, code the time of occurence with the item "others"; this does not apply to the A-category.

Three observers trained themselves in the use of the instrument by coding videotapes of micro-lessons and discussion about their difference in marking. Time devoted to training was about three hours.

4.2. Experiences from try-out.

The one observer that did not train appeared to be unable to mark any cue in the classroom situation.
The other three could follow the flow of events rather easily and noted nearly all the occurences of cues. This could be shown by a following recoding of the recorded audiotape of the lesson, which showed no extra cues.
The interpretation of the cues was rather easy for lessons where the teacher made explanations. Serious problems arose however in two cases:

A. Where the lesson carried on in the question-and-answer-mode, very few cues seemed to be present. The explanation for that can easily be found if one accepts the idea, that questions are often a cue in itself. (see the paper to be presented by Krammer at the Hamburg meeting). In such a lesson the observer should be extremely attentive as to the teacher giving guiding remarks to the questions. (which is definitely a cue in our opinion, see below).
B. Where the lesson consists of solving problems as is usually so in mathematics, the cues seem to be af another type than in explanations: At least the descriptions (given in appendix IV) do not always fit to this occasion. One needs thorough understanding of what is to be learned in a problem solving lesson what the "content" is. Probably Gagné's approach gives the answer: In problem solving one learns the solution of that problem - and possibly adjacent problems - in applying rules, higher order rules, cognitive strategies. (Gagné, 1977).

The troubles with coding cues in a problem solving process are deteriorated if the lesson is carried out in the questioning way.

In Appendix VI for several items an interpretation is given, which fits better to the questioning situation and to the problem solving situation.

In Appendix VII other remarks are given about the use of the items and the identification of cues. Several of them may lead to a remark in the instruction or to a part of an observer training to be developed.

A few new items were suggested after the try out observations:

B7: Teacher mentions the parts of a definition, rule or algorithm separately.

B8: In handling questions or problems teacher gives hints for the direction of the answer or solution.

E5: Teacher says that he postpones the treatment of some issue, will return to it later.

All observers expressed their preference for a shorter list.

4.3. The occurence of cues.

In the mathematics lessons observed the occurence of B2, B4 and D1 were abundant. (B2 was coded, when the teacher used number-examples for an algebraïc formula).

In the physics lessons there also was an abundance of B2 and D1. Here the teacher tried to introduce a new concept by the use of various examples and little experiments.

These two phenomena focus attention on the problem, that the frequency of occurence of a certain type of cue may not be the right measure to work with in the analysis phase.

5. Concluding remarks.

- The instrument as developed is suited to code the cues given in an explanatory lesson, for instruction in problem solving

and for lessons in the questioning style appropriate items must be generated and further try outs are needed

- The categories as chosen need further inspection, both by the interpretation of a greater sample of judges and by the analysis of empirical material from classroom observation. First observations throw doubt on the usefullness of the E-category. (Structure of lesson)
- More empirical evidence is needed for a measuring scale which is going to be used for the categories, and which should give way to manageable analysis techniques
- Several ambiguities in the use of the item-list can be overcome by a careful design of an observer's manual.

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APPENDIX I.

List of possible cues.(given in random order)

1. Teacher relates new element to elements already known.
2. Teacher provides extra material in addition to textbook.
3. T. repeats answer from pupil, or text from textbook, in other words.
4. T. explains new element gradually.(e.g. steps in proof or derivation are clearly separated.)
5. In giving explanations, T. indicates links with specified parts of textbook.
6. T. begins lesson (or part of lesson) by telling what pupils are expected to know after lesson, or by telling general intention of lesson.
7. T. tries to direct pupils' attention to important issues by means of expressions like 'this is important', 'do pay attention to this' etc.
8. T. spends some time (... minutes) in focusing attention to a particular problem or subject.
9. T. tells explicitly which issues from the material can be applied, or have application in everyday life.
10. T. gives concrete examples of abstract concepts or rules.
11. T. gives opportunity to make notes during the lesson.
12. T. uses visual aids to underline important issues.(e.g. putting a formula in a box, marking with distinct colour)
13. T. tells exactly what pupils should do in the lesson, gives clear instructions.
14. T. summarizes parts of lessons.
15. Definition of a concept, or statement of a rule, is followed by examples.
16. T. falls silent after verbal explanation to underline the importance.
17. T. demonstrates pupils how and where they can find an answer, in case they can not solve a problem.
18. T. uses visual aids for purposes of illustration.(slides, blackboard, overhead projection sheets)
19. T. gives schemes, diagrams etc. for visual grouping or classification of subject matter elements.
20. T. mentions that certain kinds of questions, problems etc. can be expected in pupils tests.
21. T. writes down difficult words and explains them.
22. T. finishes lesson with a summary of the material dealt with.
23. T. recommends to learn and remember certain element, with reference to central place in the subject matter.
24. T. specifies in advance what kind of activitities will be included in the lesson.

25.T. starts lesson, or part of lesson, with short survey of subject matter to be treated.

26.T. tells pupils where they can find extra materials and information about the subject.

27.T. points out important issues verbally.

28.T. puts questions on pupils' knowledge and experience, or asks for examples in connection with subject matter.

29.T. tells explicitly, that a part of the lesson finishes and another part begins.(e.g. 'enough about effects of unemployment, what causes unemployment?')

30.T. encourages pupils to look for additional information about a subject.

31.T. emphasizes important issues by changing pitch and volume of speech.

32.T.puts out precisely how pupils should work on their homework.

33.T. has the pupils write down important issues during the lesson.

34.T. has the pupils mention the important issues of subject matter dealt with before.

35.T. tells pupils exactly what they should learn well, what roughly and what is not so important.

36.T summarizes former lesson, or has pupils summarize subject matter dealt with before.

Instruction for judging the list.

Indicate to which category each item applies best.(A,B,C,D,E, according to the description in appendix III.)

If possible, indicate one category, but you may choose two.

In case assignment to category is impossible to you, indicate F.

If you can find other possible cues, please mention these below.

APPENDIX II.

Outcome of classification in categories by 4 judges.

Item nr.	judge nr. 1	2	3	4	Item nr.	judge nr. 1	2	3	4
1	B	C	C	B	19	C	C	C	C
2	C	B	C	C	20	A	A	D,A	A
3	B	B	B	C	21	B	B	B	B
4	B	C	B	C	22	C	C	C,D	A,B
5	C	C	C	C,B	23	D	D	D	C
6	A	A	A	A	24	E	E	E	E
7	D	D	D	D	25	C	C	C	A,B
8	D	D	F	D	26	C	C	C	C
9	B	B	B	B	27	D	D	A	B
10	B	B	B	B	28	B	B	C	C
11	E	E	E,D	D	29	D	D	D	D
12	D	D	D	D	30	C	D	C	E
13	E	E	E	E	31	D	D	D	D
14	C	C	C,D	B,A	32	E	E,C	E,C	E
15	B	B	B	B	33	D	D	D	B,C
16	D	D	D	D	34	C	C	C	B,C
17	C	C	C	C	35	A	D,A	A	A,D
18	B	B	B	F	36	C	C	C	B,C

On this evidence, following items were not used in the second draft :

1. Teacher relates new elements to elements already known.
4. Teacher explains new element gradually.(e.g. steps in proof or derivation are clearly separated.)
27. Teacher points out important ideas verbally.
28. Teacher puts questions on pupils' knowledge and experience, or asks for examples in connection with subject matter.
30. Teacher encourages pupils to look for additional information about a subject.

APPENDIX III

Description of the categories.

A learning element can be a piece of information (fact), a concept, a rule, a method for problem solving.

A. SPECIFYING LEARNING OBJECTIVES.

Action taken by the teacher to supply information about the objectives to the pupils. A behavioral aspect ("mention","define","solve"etc) should be present: If only information about learning content is given, category B, C or D applies.

B. CLARIFICATION OF LEARNING ELEMENTS.

The clarification is done for one element, relating to other elements should be classified under C or D. Possible clarifications are: Instances or applications from daily life, indication of social context, making concrete or visualize abstract concepts.

C. ORGANIZATION OF CONTENT AND LEARNING MATERIAL.

Teacher's actions by which he/she makes clearer
- the structure of the "body of knowledge".
- the relations with other learning elements.
- the relations with subject matter dealt with in former lessons.
- the way the content structure is represented in the learning material.
- how pupils can find their ways in the learning material.

Not included are
- organization of the lesson.(see E)
- relating to experiences outside school.(see B)
- signals that some element is more important than others.(see D)

D. SIGNALS OF TRANSITION AND IMPORTANCE.

Actions from the teacher that communicate to pupils, that the subject of the lesson changes in some way, that another learning element comes in, or that certain elements(or sentences, pictures etc.) are more important than others.

E. STRUCTURING OF LESSON;

Cues that communicate to the pupils what can be expected in the lesson, what they are expected to do, without reference to subject matter.

APPENDIX IV : Item list as used in classroom observation try out.

A. Specifying learning objectives.

A1. Teacher starts lesson, or part of lesson, by telling what pupils are expected to know after the lesson, or by telling general intention of lesson.

A2. Teacher tells pupils exactly what they should learn well, what roughly and what is not so important.

A3. Teacher mentions that certain kinds of questions, problems etc. can be expected in pupils tests.

B. Clarification of learning elements.

B1. Definition of a concept, or statement of rule, is followed by examples.

B2. Teacher gives concrete examples of abstract concept or rule.

B3. Teacher writes down difficult words and explains them.

B4. Teacher uses visual aids for purposes of illustration.(slides, blackboard, overhead projection sheets,.....)

B5. Teacher tells explicitly which issues from subject matter have applications in daily life, or can be applied.

B6. Teacher repeats answer from pupils, or text from textbook, with use of other words.

B7. Others.(Specify)

C. Organization of content and learning material.

C1. Teacher summarizes former lesson, or has pupils summarize subject matter dealt with before.

C2. Teacher has pupils mention issues of subject matter dealt with before.

C3. Teacher starts lesson, or part of lesson, with short survey of subject matter to be treated.

C4. Teacher gives schemes, diagrams etc. for visual grouping or classification of subject matter elements.

C5. After (a part of) the lesson, teacher summarizes subject matter.

C6. Teacher provides extra material in addition to textbook, or tells pupils where they can find extra material and information about the subject.

C7. Teacher demonstrates pupils where and how they can find an answer, in case they can not solve a problem.

C8. In giving explanations, teacher indicates links with specific parts of the textbook.

C9. Others.(Specify)

D. Signals of transition and importance.

D1. Teacher spends some time (... minutes) in focusing attention on a particular problem or subject.

D2. Teacher tells explicitly that a part of a lesson finishes and that another part begins. (e.g. "enough about effects of unemployment, what causes unemployment?)

D3. Teacher tries to direct pupils attention to important issues by means of expressions like "this is important," "do pay attention to this" etc.

D4. Teacher emphasizes important issues by changes in volume or pitch of speech.

D5. Teacher falls silent after verbal explanation to underline the importance.

D6. Teacher uses visual aids to underline important issues.(e.g. putting a formula in a box on the blackboard, marking with distinct colour.)

D7. Teacher has the pupils write down certain issues during the lesson, with reference to the importance.

D8. Teacher recommends good learning and remembering of certain element, with reference to the importance.

D9. Others.(specify)

E. Structure of lessons.

E1. Teacher specifies in advance what kind of activities will be included in the lesson.

E2. Teacher tells exactly what pupils should do, gives clear instructions.

E3. During the lesson, teacher gives opportunity to make notes.

E4. Teacher points out precisely how pupils should make their homework.

E5. Others.(specify)

Comments, specification of added cues.

APPENDIX V

Coding sheet for cues.

Minute nr.	1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46
A 1																
A 2																
A 3																
B 1																
B 2																
B 3																
B 4																
B 5																
B 6																
B 7																
C 1																
C 2																
C 3																
C 4																
C 5																
C 6																
C 7																
C 8																
C 9																
D 1																
D 2																
D 3																
D 4																
D 5																
D 6																
D 7																
D 8																
D 9																
E 1																
E 2																
E 3																
E 4																
E 5																
Minute nr.	1	4	7	10	13	16	19	22	25	28	31	34	37	40	43	46

Date: Teacher: Class: Nr.of pupils:

Hour: Observer: Subject:

APPENDIX VI

Modification of item description, in case the lesson is not mainly an explanation.

Item nr.	Question-and-answer lesson.	Problem solving lesson.
B8 (see p.15) a	Teacher poses a new question, which means narrowing down the problem in a preceding, not answered question.	
C1, C2	Teacher puts questions on a subject dealt with before, and makes the class aware of the right answer.	
C3		Teacher gives an overview of the problem to be solved, gives a preface of a possible solution.
C4		Teacher gives something like a flow chart of the solution process for a (class of) problem.
C5		After finding a (partial) solution, teacher summarizes what has been done.(and what is still unsolved.)
C8	Teacher indicates, that the answer on a question is contained in the book.	Teacher relates to cases and problems (with or without solution) that are treated in the book.
D2		Teacher indicates for a new problem what the difference with preceding problem is.
D5	(If teacher falls silent after a question, this should not be considered a cue.)	Teacher falls silent after finding a part of the solution to underline the importance.

APPENDIX VII

Miscellaneous remarks on the use of items.

A2 Always when teacher expresses that something is not important, there is a (negative) specification of learning objectives. The D-category can not be used in these cases.

B1 Using an inductive process of thinking -as can be the case in physics
B2 instruction- the examples precede the definition of a concept or the statement of a rule.

B4 Not all use of the blackboard is a cue, e.g. when the teacher takes over a problem from the book on the blackboard there only is duplication of information on another medium. See also D6.

D1 The formulation "....minutes" gives rise to ambiguity. The focusing of attention can also take place in a few seconds.
The distinction with C3 (survey at start of lesson) should be made properly.

D6 See B4. The distinction with B$, and in some cases with C4, should be made properly.

E1 The boundary with C3 and A1 tends to become unclear, e.g. when introductional activities have both a management character and a content related character.

E2 As with E1, it may be hard to decide if an instruction has only a management character.

E3 The same problem as E1 and E2, the distinction with B8 may be unclear.

COLOFON:
Publisher : Department of Applied Education,
Twente University of Technology
Typist : Ely v.d.Velde Heskamp
Reproduction: Central Reproduction Department of the
University
Edition : 60